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DATA ON A SLABBING MILL IN THE USSR

M. Gorbassev, G. Prishchepenko, and O. Raid describe the slabbing mill for the continuous-strip mill in Zaporozhye. The future capacity of the slabbing mill is given at 1,600,000 tons of slabs per year. Of this amount, 670,000 tons are intended for motor-vehicle sheet metal.

The room housing the soaking-pit installation is 203 meters long. In it are contained 32 cell furnaces of American design. These are 4,000 millimeters long, 2,250 millimeters wide and 3,000 millimeters high. Expansion to 40 cell furnaces is possible. The furnaces are divided into groups of four. They are fired by mixed gas (blast furnace and coke oven gas). The heating value of the mixed gas amounts to 1,150 to 1,200 calories per cubic meter. Each cell furnace has two Siemens regenerators to the left and right of it, one for air and one for gas. Preheating reaches 850 to 900 degrees. Air regenerators have the following dimensions: width, 1,650 millimeters; length 2,600 millimeters; height, 4,290 millimeters. Gas regenerators have the following dimensions: width, 1,650 millimeters; length, 2,600 millimeters; and height, 3,725 millimeters. The covers of the furnaces are made of a cast-steel arched frame with a fire-brick lining. They are attached to a movable car which can be guided both from the platform and from the crane.

Four groups of the cell furnaces are lined with fire brick. The other four groups have the upper part of the furnace lined with Dinas brick because of the high temperatures, i.e., 1,300-1,350 degrees. The bottom is made of magnesite brick. Dinas brick has been used for the checker work and arch of the regenerators. Gas and air supply are regulated separately for each furnace by Porter valves and clack valves. This brings about a better adaption of the furnace to all operational conditions (cold or hot charge, quality of material with high or low carbon content, etc.) Each group is provided with gauges for controlling the temperature, volume of gas and blast, gas and blast pressure, as well as the draft in the discharge pipe.

Two types of slab are provided for the slabbing mill, 6- to 9-ton slabs for motor-vehicle sheet metal and 15-ton slabs for commercial

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sheet metal. A warm charge is used for 80 percent of the operations, a cold charge, for 20 percent. Each furnace is charged with six 8-ton slabs or four 15-ton slabs for a warm charge. The heating period lasts 3.5 hours. Four 8-ton slabs or three 15-ton slabs are used per furnace in a cold charge. The heating period lasts seven hours. This indicates that a group of four furnaces has an hourly capacity of 55 tons with a warm charge and 18 tons with a cold charge.

The universal slabbing stand has a set of vertical and horizontal rolls. The horizontal rolls have a diameter of 1,100 millimeters, a working surface of 2,000 millimeters and a pin diameter of 680 millimeters. Each is operated by two separate 5,000-horsepower reversing motors. The revolutions per minute can be regulated within a range of from 0 to 50 and 100. The windings of both motors are arranged parallel to ensure the same number of revolutions. Starting and equalization of weight of the upper roll are worked by electricity. The vertical rolls are arranged in front of the horizontal rolls. There is a decrease of up to 20 millimeters for each pass in the vertical rolls. The rolls have a diameter of 680 millimeters, and the pins, a diameter of 450 millimeters. Both vertical rolls are operated in common by a 2,500 horsepower DC motor with 0-100-275 revolutions per minute. The vertical rolls are also started by electricity. The horizontal rolls are of tempered alloyed steel with the following composition: 0.35 to 0.45 percent carbon, about 0.60 percent manganese, 0.20-0.35 percent silicon, 0.04 percent phosphorus, 0.04 percent sulphur, 0.50-0.75 percent chromium, 1.25 - 1.75 percent nickel. This steel has a tensile strength of 60-70 kilograms per square millimeter, a maximum elastic limit of 35 kilograms per square millimeter, and 10-12 percent elongation. The vertical rolls, on the other hand, are of wrought steel. A roll output of 250,000-300,000 tons in seven to eight refinishings is estimated in the case of the horizontal rolls; 500,000-600,000 tons, in twelve refinishings in the case of the vertical rolls. The slabbing mill has a special roll apparatus that makes possible the simultaneous removal and reinstallation of both horizontal rolls.

The edger and shifting device consists of two straightedges each, in front and in back of the stand. One of the front straightedges has four edge cams. The front and back straightedges are coupled left and right, preventing the forward slip of the straightedges in front or in back of the stand. The straightedges travel a maximum of 1,500 millimeters. The shifting speed is 0.5 meters per second; the edger travels a maximum of 900 millimeters at a speed of 0.7 meters per second.

The slabs for the sheet metal are 2,000 to 4,500 millimeters long, 600 to 1,500 millimeters wide, and 75 to 165 millimeters thick; those for intermediate plate are 1,000 to 1,800 millimeters long, 600 to 1,500 millimeters wide and 65 to 200 millimeters thick. Steel for motor-vehicle sheet metal (deep-draw quality) is cast in 8- to 9-ton ingot slabs; steel for commercial sheet metal is cast in ingot slabs of about 15 tons. The vertical rolls are adjusted after every pass during the rolling process. In this way, side pressure is always exerted on the slab and the number of passes is considerably reduced as compared with rolling in a blooming mill. For example, a 627 x 1,000 millimeter slab is to be rolled down to 76 x 914 in 21 passes. After the second and fourth pass the slab is tilted 180 degrees for descaling. The descaling is assisted by intensively spraying the slab during the rolling process with water at 72 atü (atmosphärenüberdruck: gauge pressure in atmospheres). The spraying apparatus, set up between the horizontal and vertical rolls is automatically controlled by a photoelectric cell.

The slab shears are characterized by an extremely powerful design (total weight, 580 tons; weight of stand, 125 tons); a very high working pressure of 2,000 tons, simplicity of operation without flywheel, automatic control, and high capacity. They can cut slabs of from 75 x 600 millimeters to 200 x 1,500 millimeters at a minimum of 900 degrees. They are operated by four motors of 160 kilowatts each (including spares). These, together with their driving gear, are set up on the shears stand. The advantage of this is that plant floor remains free and favorable conditions are created for a suitable arrangement of auxiliary equipment and for servicing the shears. The shears cut from above; their capacity is ten 75 x 1,500 millimeter slabs or five 200 x 1,500 millimeter slabs per minute.

There is a pressure apparatus in front of the shears to push through the short slab ends which cannot be moved by the live-roller-type feeding table. The shortest slab that can be handled is 2,500 millimeters long. An oil-powered pressure apparatus behind the shears keeps the slabs on the roller table and the lower blade stand.

This is supposed to eliminate lifting the back end of the slab, which shortens the life of the roller and the shears blades and mars the quality of the cut.

A 6,000-millimeter-long tipping table behind the shears is set up to receive and move on the slabs which have been cut to measure. The movable projecting part can be adjusted to cut slabs from 1,000 to 4,500 millimeters in length.

All the roller beds of the slabbing mill and the slab shears are operated by bevel-gear wheels. All roller beds, drive shafts, and transmission shafts have swing roller bearings; the other turning parts have friction bearings. All bearings and friction surfaces, which require lubrication in 500 places, are lubricated by four groups of pressure-lubricating apparatus. A scales operating with compressed air is built into the delivering live-roller table. It has a load capacity of 30 tons and weighs the slabs in about two seconds.

The slabs intended for the sheet-rolling mill are moved directly to the slab furnaces provided they have no surface flaws. Slabs with surface flaws and all those intended for intermediate plate go to the slab storehouse. This consists of two rooms 174 meters long and 30 meters wide. Each room has two 30-ton traveling cranes. Here the slabs are cleaned and stacked. The storage capacity of the slab storehouse amounts to two and a half days total production of the slabbing mill.

Since most of the slabs arrive in storage while still warm, gates 3.5 millimeters high were built in the walls to carry off the heat which is given off by the slabs. In addition it was planned to spray the slabs thoroughly.

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